"The Importance of Price in Re-Negotiating Long-Term Supply Contracts from Softwood Plantations – The Case of Queensland Australia"

by

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Quayle, Michael J (2004) The Importance of Price in Re-Negotiating Long-Term Supply Contracts from Softwood Plantations – The Case of Queensland Australia. In *Proceedings International Symposium Human Dimensions of Family, Farm and Community Forrestry*, Pullman, Washington, USA

Abstract

It is often thought that log sales from plantation and natural forests are determined in free and open market auction systems. This is often the case for those countries with a competitive market structure in these industries. Competitive market forces therefore determine log prices in these markets. However, in those countries where log markets are less-competitively structured and asymmetry of market power resides on either or both sides of the market, open auction systems may not be optimal.

In the state of Queensland on the eastern seaboard of Australia, characteristics of the log market suggests uncompetitiveness at the structural level of the market. Many of the markets are regionalised and highly concentrated on both sides of the market.

This paper seeks to address the theoretical ramifications of high market concentration and its impact on log price determination, the process of price determination and the sharing of economic rents from bargaining processes. A bilateral model is presented to address these issues and variations in log supply from small family forest farmers are included in the model.

Key words: *Log sales, market structure, log pricing, bilateral monopoly, concentration*

Introduction

Log sales in both northern and southern hemisphere countries are usually negotiated through a number of processes which include: spot market sales at the stump or delivered to the mill gate, short term contracts over one to two years, or long term contracts between supplier and buyer for terms between 15-25 years. Contracts normally stipulate the terms and conditions for supply including estimated volume of timber on the harvestable tract of forest, species, price per volume in cubic metres, contract duration, and on-sale arrangements. Long-term contracts also include conditions for adjusting price through the duration of the contract to maintain the real price value of timber at the contract date.

The process of selling logs, contract type and contract duration, varies across countries. In the Scandinavian countries, the US and NZ, log markets are considered to be structurally competitive and spot market sales and short-term contracts are the norm.[1]

Structurally competitive markets are expected to yield cost minimisation and efficient prices that signal resources should be allocated to the industry to the point where resource returns equal their opportunity cost. Structural competition normally implies that many buyers and sellers produce the competitive forces that ensure that prices reflect costs of production and efficiency. Any departure from structural efficiency or competitive behaviour will result in a misallocation of resources, a distortion in prices from minimum costs and poor signalling for attracting resources to the industry for investment purposes. Consequently, market structure is considered important for efficiency for market price determination.

Structurally competitive markets are apparent in those countries that sell logs principally on the spot or short-term contract markets. Finland, Sweden, Norway have a large number of smaller sized forest growers who sell their logs at 'roadside prices' at delivered prices or at the stump to cutting contractors. Competitive markets also operate in the mountain states of western US where a large number of smaller log suppliers prevent concentration on the supply side of the market, while the New Zealand market has become highly competitive over the past 20 years with private small scale operators commanding more than 20 per cent of the supply side of the market.

Apart from Haile's (2001) work on auctions of log sales from the US forest service and on-selling to other retail markets and Paarsch's work on stumpage rates and timber recovery (1993), little has been written on competitive log sales and price determination. Lohmander (1987), Thompson (1992) and Washburn and Blinkley (1993) were concerned with information efficiency for determining log prices at the stump in competitive markets. However, much of this work has been in competitive market environments and little attention has been paid to log sales in markets that are structurally uncompetitive with high degrees of concentration on either the supply and/or the demand side of the market.

This paper concerns itself with log sales in a market that is highly concentrated on both the seller and buyer sides of the market. Non-competitive prices emerge in these market environments and the prices achieved for the log resource don't necessarily reflect the opportunity cost of the resource.

[1] The New Zealand log market is highly competitive and structurally efficient. Logs are offered for sale through one of three options: Lump Sum Sale, Stumpage Sale, or Prepared log Sale. Lump Sum Sales involve sale of the forest tract at a specified price which could be higher or lower than the log price at the mill, stumpage sales pass the responsibility of the price setting to the owner, while prepared log sales pass all responsibilities to the owner for cutting and delivery.

Specifically, the state of Queensland in Australia is analysed to explain price outcomes for log sales in highly concentrated buying/seller markets.

Log Sales in Queensland

Australian forests cover some 42 million hectares with native forests representing 97% of this area. Commercial softwood / hardwood forest plantations in Australia account for approximately 1.2 million hectares and are primarily located on the Eastern seaboard States of Queensland, New South Wales, Victoria, Tasmania and South Australia (ABARE 1999).

Softwood plantations are more common than hardwood plantations in the eastern states of Australia with New South Wales the largest having 293,000 ha and Queensland 173,000 ha (National Forest Inventory, 1998). Hardwood plantations cover a much smaller area in these states where only 13% of the plantation estate in New South Wales is hardwood plantings. It is even less in Queensland with just over 4,000 ha of hardwood forests planted as commercial plantations.

For both these states, public ownership of commercial plantation forests is high. The state government forest authority in Queensland (Queensland Primary Industries –Forestry QDPI-F) still owns and controls 89% of commercial forest plantations in the estate while its counterpart in New South Wales – State Forests New South Wales - controls approximately 70% of commercial plantation forests. For all the eastern states in Australia public ownership of commercial plantation forests remains at about 66% of the forest estate, despite a strong move in the 1990s towards privatisation and corporatisation of state government forest authorities. While Tasmania traditionally has had high levels of private ownership it was not until 1995 that the state of Victorian commercial plantations become predominately privately owned. The Victorian Plantation Corporation sold its holding of plantation forests to the private sector reducing public ownership of plantation forests in the eastern seaboard states of Australia. Nevertheless, the states of Queensland and New South Wales have retained substantially high levels of public sector control and ownership over this resource.

Queensland plantations are predominantly located in the South-Eastern (SE) and Northern (NQ) districts of the state, covering an estimated 178,000 ha with the majority of this area still under government ownership and control. The SE district is the largest plantation area in the state with 148,000 ha. Exotic softwood varieties *Pinus elliottii* and *P. caribaea* predominate as species but the native variety *Aracauria cunninghamii* has a considerable presence with some 28% of the commercially-planted forest area in Queensland It is estimated by QDPI-F that *Aracauria cunninghamii* has the potential to expand to an area of 58,000 ha over the next 20 yearly growth cycle period. Commercial plantations of hardwoods have a smaller presence in Queensland as hardwoods were extracted from native forests until recently and alternative sources of supply were required when logging was prevented in these areas. However, in the neighbouring state of New South Wales commercial hardwood plantations cover an estimated 44,500 ha. with a capacity to double this area within 20 years.

Most log sales in Queensland follow the propositional call method. QDPI-F as the major supplier of logs identify those forest tracts that are approaching maturity and estimate the volume per hectare likely to be harvested and a reservation price for the timber is set. If a number of tracts expect to be ready for harvesting over a number of rotational periods, a long or short-term contract may be offered in the sale description of the timber. QDIP-F then calls for expression of interest for closed bid price for the forest tract timber from potential buyers. It is these bids that are called propositional calls. It is normally the case that only one and usually no more than two propositional calls are

received for any forest tract sale. The propositional call system is not an open-auction competitive bidding system and nor is it a closed tender system where a number of buyers offer tenders for an advertised forest tract of timber. Rather, the propositional call system collapses into a negotiated sale agreement between a single buyer (usually advantageously located to the state forest) and a single monopolist supplier – QDPI-F. It is through this system that stumpage prices are determined. Reservation prices, on the other hand, are set by the supplier and based on a number of economic and financial criteria including production costs, rate of return, employment creation and industry development targets.

Cost-based Pricing – a clarification

A number of pricing regimes could be adopted for log sales, including marginal cost pricing, full average cost pricing or market based pricing based on price elasticity of demand for the resource. The supplier has greatest control over cost-based pricing options.

Marginal cost pricing can be interpreted for either the short or the long run. Short run marginal costs can be defined as the additional costs incurred from supplier a greater volume of timber to the market from an existing forest estate. If the price of logs were to rise, the supplier would be encouraged to offer higher volumes of logs for sale by bringing forward harvesting of trees not yet at their full maturity date. The marginal costs incurred in increasing supplies in the short run include the additional capital and labour logging costs and the maintenance costs of bringing the stand of timber to a harvestable position. Full average cost pricing on the other hand includes all costs including those fixed costs incurred in establishing the plantation and the initial planting. From a marginal cost point of view these costs are 'sunk' and are excluded from the pricing formula. QDPI-F follows the full average cost pricing principle (albeit adjusted for political and economic expediency) for setting its reservation sale price for timber lots.

Table 1 below illustrates estimated management, harvesting and transport costs for sawlog plantations. These costs equate with short-run marginal costs of increasing log supplies from the existing forest estate. As more and more timber is demanded from the existing forest estate the harvesting costs increase, the stumpage rate increases and the additional volume per ha harvested decreases. Consequently, as the price of logs rise in the short run, the quantity of logs supplied increases at a decreasing rate.

Table 1 Management, harvesting and transport costs for sawlog plantations – short run marginal costs estimates.

Activity	**Cost ($)**
Roading for Access ($ha)	133
Pruning (300 stems/ha age 4 years)	449
Roading for each thinning ($ha)	133

Inventory and Analysis ($/ha)	70
Marking for thinning ($/ha)	50
Harvesting for each thinning ($/ha)	21
Road age for clearfell ($/ha)	133
Harvesting Clearfell ($/ha)	18
Transport for logs ($/m3/km)	0.13

Source: GRO 1999.

Cost based pricing for logs in the long run involves expanding the size of the plantation estate. Long run marginal cost pricing includes the opportunity cost of the resources of land, capital, materials and labour incurred in increasing the number of hectare under plantation cultivation. In the long run, all costs are variable which implies that long run full average cost pricing equates with the long run marginal cost pricing estimates. These cost estimates influence the nature and shape of the supply curves even when the market is structurally uncompetitive.

Table 2 below illustrates the fixed cost elements in current dollar terms and present value terms in the long run. The long run in this case is the expansion of the plantation forest estate over a rotation period of 28 years for a medium quality site. A number of iterations plantation size increases from 10,000 m3 annual volume output to 130,000 m3 of sawlog yield are estimated in this table. For example, planting 29 ha a year for a 28 year rotation period, yields an annual volume sawlog of 10,000m3 and the associated long run fixed costs in present value terms is $1,600.

Table 2. Area and Present Discounted Establishment and Land Costs at 7% discount rate – Medium Quality Site – MAI 20 with 28 year rotation.

Annual Volume ('000m3)		Area of Land (Ha)		Land Cost @$2600/Ha		Establishment Cost ('000s$)		Land & Establishment Cost ('000s$)	
Sawlog (62%)	Small Round wood (38%)	Annual Planting	Total	Current Annual	Total PV	Current Annual	Total PV	Current Annual	Total PV
6.1		29	812	75	900	56	682	132	1,600
12.3		58	1,624	151	1,800	112	1,363	263	3,200
18.4		86	2,408	224	2,700	167	2,022	390	4,700
36.8		173	4,844	450	5,500	335	4,067	785	9,500

	61.3	288	8,064	749	9,100	558	6,771	1,307	15,900
130	79.7	374	10,472	972	11,800	724	8,792	1,697	20,600

Source: Australian Bureau of Agriculture and Resource Economics and Bureau of Rural Sciences, (1999).

Certain economic interpretations can be ascertained from this data in Table 2. It would suggest from columns 1 and 10 in Table 2 that as the size of the plantation increases (size of the firm) total discounted costs increase with the increase in output, measured as annual volume ('000m3) of sawlogs. From the estimates in these columns, the cost elasticity of output is equal to unity implying there are no economies of scale to be gained from a larger size forest plantation estate than a smaller plantation size when establishment and land costs are considered.[2] This also appears to be the case if the quality of the input land increases in value in the production function. In the long run, the supply of logs from an expanded forest estate is highly price elastic.

Market Based Pricing

When the factor input market of logs and the final output commodities market of processed timber are highly or perfectly competitive, profit maximising firms will demand more log inputs to the point where the productive value of the last cubic metre of logs equates with the additional revenues those additional factors earn in the production and sale of the final output. In other words, the value of the marginal product of logs (VMP) equates with the marginal revenue product (MRP) derived from log inputs.

$$VMP = MRP = MPP * MR$$

Where P = MR in the commodity market.

However, when firms are imperfectly competitive or monopolistic in the commodities market, their MR < P so that factor inputs (logs in this case) are paid less than their marginal product value. For monopsonist firms (only one large buyer) in the market for the factor inputs of logs, the demand for the logs equates with the MRP of the logs not the VMP. In this case the supply of Labour has a positive slope: as the monopsonist increases the use of the factor input (logs) he has to pay a higher price for the additional logs, which places the monopsonist's *marginal expenditure* curve above its *average expenditure* curve; this being the supply curve of logs. This *marginal expenditure* curve is denoted as the ME curve in Figure1. The firm will be in equilibrium when it equates the marginal expenditure on the factor (ME) with its MRP, which is its demand for the factor input – logs.

Bilateral Monopoly

When a monopsonist is the only buyer of the factor input and there is only one supplier of the factor in the market a bilateral monopoly exists. Under bilateral monopoly market conditions a precise market price for the factor input is not determined; only the upper and lower limits within which the stumpage price for logs is determined through bargaining between the parties involved

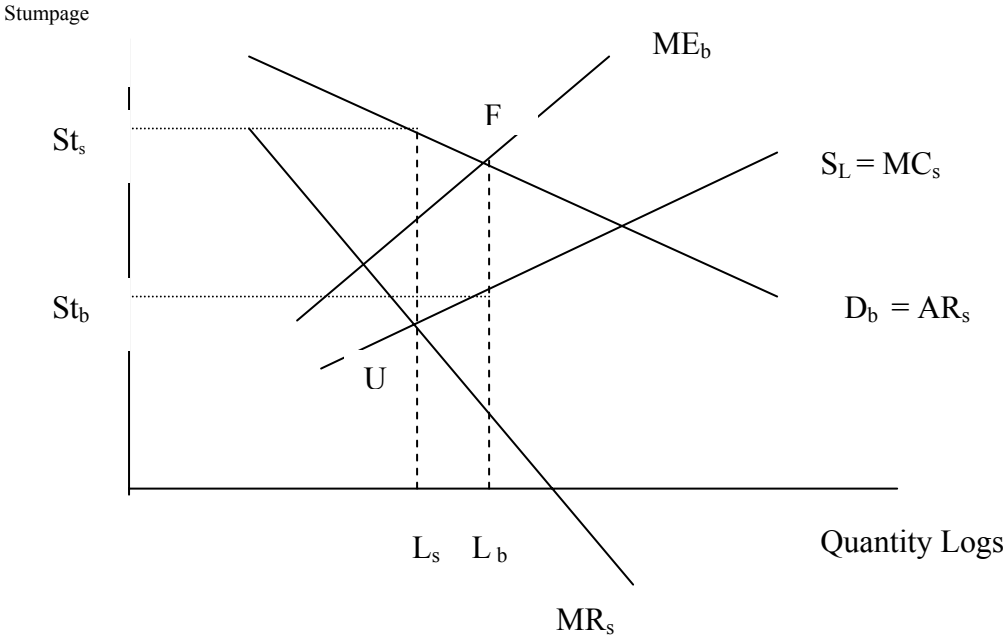
[2] The present value discounted cost estimates in Table 2 are predicated on the assumption that input costs don't vary in real value through time.

(Koutsoyiannis 1987). The eventual price fir the factor depends on the bargaining skills of the parties involved and political and economic considerations may play a role in striking an agreed price.

The monopsonist will express a demand for the factor input in accordance with the MRP of the factor (its demand curve) and will choose to employ that level of factors where its marginal expenditure outlays on additional factor inputs (logs) equates with the MRP for the factor - its demand for the factor. The price that the buyer is offering for the quantity of logs at this volume level is determined by the supply curve of logs for that volume, not from the ME curve. Consequently, the buyer wants a larger quantity of the factor input and wants to pay a lower average price for the quantity. This result is shown in Figure 1 below.

The supply of logs facing the monopsonist buyer is the upward sloping supply curve S which is the *marginal cost* curve of the supplier of logs. As the supplier is aware that its marginal revenues are derived from the demand curve for logs, its marginal revenue curve is expected to be lower than the demand curve for logs. These relationships are illustrated in Figure 1. The supplier therefore sets its price in accordance with the rule that it will supply logs to the point where its marginal revenues from the last sale equates with its marginal cost (supply curve). Price is negotiated from this level determined from the corresponding point off the demand curve.

Figure 1: Price Indeterminancy in the a Bilateral Monopoly Input Market – the Case of Logs



In Figure 1 above the supplier in a bilateral monopoly situation prefers to supply L_s volume of logs at a price of St_s , setting the upper limit to the price negotiations, and the buyer sets the lower limit price level by demanding a larger volume of logs at a lower preferred price of St_b . Bargaining between the two parties results in a price between St_s and St_b . The economic rent from the resource is shared between supplier and the buyer.

The Queensland Case

The National Plantation Inventory of Australia (2002) estimated that for the year 2001 softwood plantation ownership in Queensland was 98% held by the public sector – viz, the state government forestry authority QDPI-F; making this authority a monopolist in softwood log supply in the factor input market in Queensland. By the end of the year 2000 there were still 23 long-term contracts between 15 and 25 years still operating in Queensland. A number of these contracts had been won by the same processing plants mainly located in the south-east corner of the state. Overall the number of processing and milling plants holding supplier contracts for timber logging in Queensland numbered seventeen. These plants are distributed along the Queensland coast and are advantageously positioned near large QDPI-F forest plantations. Normally, only one processing plant is located near each plantation with guaranteed supplies to the buyer. Some of these buyers are large in size taking all offered logs, others are smaller in size and specific in processing requirements demanding only thinnings – preferring a smaller size log. These regionally located plants are monopsonist buyers and QDPI-F is a monopoly input supplier. The bilateral model applies to price striking for contract on logs from softwood plantations.

In the propositional call system expressions are called for logging rights and stumpage payment for tracts of plantation forests approaching maturity date. QDPI-F sets a reserve price and a preferred monopolist price for the logs and attempts to bargain for a high price. The buyer bids a price as close to competitive price (reserve price) and attempts to bargain for a low price. Negotiated prices on the contract are set as a compromise between the upper and lower price limits of St_s and St_b , as shown in Figure 1.

The hardwood plantation estate in Queensland is small compared to softwoods and comprises only 11% of the total plantation estate. Of this the public sector owns only 2% of hardwood plantations with the remainder in private ownership. More competition exists in this market but the market size of Queensland supplied timber is small.

Conclusions

It has been argued that when the price and demand for a factor of production is being considered it depends upon the characteristics in both the end-product commodity market (timber sales) and the factor input market (log market). A firm with monopolistic power in the commodities market but faces a competitive log input market will profit maximise by employing that volume of logs where the $MRP_L = MC_L$ = St rate, where MRP_L is less than VMP_L. where both the input supplier and the input buyer are monopolist and monopsonist respectively, the buyer profit maximises by setting ME_b with that of MRP_b (demand curve);and the supplier sets price satisfying the condition that the MR_S equates to the MC_S. Under these conditions where market power is present on both sides of the market, the market does not produce an optimal stumpage price and is price indeterminate.

Consequently, market power does matter. Moreover, it is shown that for the case of Queensland, there are a small number of dominant processors that are advantageously located near large plantations owned by a public sector authority. These conditions generate price outcomes that are classical bilateral monopoly determined with upper and lower price bounds between which prices are set through bargaining and negotiation. The share of the rent from the log resource is determined by the bargaining power of each party. The hardwood plantation industry is still relatively small in Queensland and much of the hardwood required by Queensland processing mills is sourced from New South Wales or natural forests.

Market pricing of logs in Queensland remains a spurious exercise when market power abounds on both sides of the market. Little improvement can be expected in this market until more competitive pressures from more suppliers (plantation owners) and more processors are established. Research into price adjustment processes of long-term contracts is a logical extension to analysing market structures in end-markets and input markets. This research is beyond the scope of this paper but would be fruitful in providing guidance on the value of logs at the stump in the future.

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